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## IDEA PROGRAM

Summary

### Performance and Evaluation Report

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Idea Proposal Number: NAG2-6002  
Final Report (Y/N): Yes  
Reporting Period: From: 9/94  
To: 9/96

- I. Principal Investigator: Dan Lester
- II. Institution: University of Texas
- III. Project Title: Science in the Stratosphere

#### IV. Summary of Project Activities

(Please answer the following questions. Be clear and concise.)

##### 1. Describe the primary objectives and scope of the project.

The Science in the Stratosphere program, first established in 1992, was conceived to introduce K-6 teachers to airborne infrared astronomy through the Kuiper Airborne Observatory (KAO), and to use this venue as a basis for seeing scientists at work in a mission-intensive program. The teachers selected for this program would bring their new perspectives back to their schools and students.

Unlike the related FOSTER program, the emphasis of this program was on more intensive exposure of the KAO mission to a small number of teachers. The teachers in the Science in the Stratosphere program essentially lived with the project scientists and staff for almost a week. One related goal was to imbue the KAO project with perspectives of working teachers, thereby sensitizing the project staff and scientists to educational outreach efforts in general, which is an important goal of the NASA airborne astronomy program. A second related goal was to explore the ways in which K-5 educators could participate in airborne astronomy missions. Also unlike FOSTER, the Science in the Stratosphere program was intentionally relatively unstructured, in that the teacher participants were wholly embraced by the science team, and were encouraged to "sniff out" the flavor of the whole facility by talking with people.

##### 2. Describe the partnerships established for the project.

The 1994 Science in the Stratosphere program was a collaboration between the University of Texas, and two selected teachers in the Austin Independent School District.

##### 3. Describe the evaluation component of the project.

###### A. Briefly describe the type of evaluation that was conducted.

**(process, outcome, or impact evaluation)**

The evaluation was process based. The selected teachers, who had extensive experience in science curriculum development, were asked to translate their various experiences with the KAO mission into K-5 insights, both during the flight series, and afterwards, when the experiences were brought into the classroom.

- B. Briefly describe the data collection procedures used in the project.**  
 (questionnaires, interviews, records, observation, and/or existing data/statistics)

Interviews and observation.

- C. Were the data collection procedures effective in measuring the project's objectives?**

Yes.

- 4. If appropriate, briefly describe how NASA source data were used in the project.**

N/A

- 5. Describe the project's findings.**

- A. If appropriate, describe the demographic information on the audience reached.**

N/A

- B. Describe the goals accomplished.**

As accomplished in the previous two years of the Science in the Stratosphere program, two local teachers with a science specialty accompanied the PI on two research flights on the KAO, and interacted intensively with the science team, operations staff, and crew. The level of interaction was very high, due in large measure to the hospitality of the KAO staff and crew. The teachers complained of being hoarse almost every evening!

The excitement of the mission was conveyed back to the students in many ways. The teachers e-mailed their students almost every day, so their classes could follow the adventures.

- C. Describe the lessons learned.**

Airborne astronomy is a rich venue for NASA educational outreach in science and technology. This lesson supports the conclusions from the first two Science in the Stratosphere program years, including the first year, which marked the first flights of pre-K teachers on the KAO. These conclusions set the stage for the large investment in educational outreach that is being incorporated into the SOFIA project.

Airborne astronomy offers unique perspectives to pre-college students on the way that space science works. In this context, one of the unique attributes of airborne astronomy is that mission operations are compact enough that teachers can be intensively exposed to the whole process -- instrument preparation, flight planning and scheduling, real-time decision making, post-flight analysis, and airborne mission support, all in the same place.

The airborne astronomy experience offers teachers special perspective on future human space science exploration, in which the entire mission is carried in a single vehicle, in which all the plans, contingencies, workarounds, and problem solving are designed to take place within the limitations of that vehicle. These 5th and 6th grade teachers said repeatedly that the space mission role-playing that their classes do as part of their science and technology curriculum would be profoundly influenced by this experience.

The main lesson of this program was simply that for K-6 ages, the mystery of science, and the respect that they develop for it, is very strongly connected with their picture of how it is done, and what people that do it are really like. This picture of a science "mission", as one that involves much more than "scientists" (who have a very poor image for this age group -- is it any wonder that we lose so many kids to science and math at this age?) is key to cultivating the image of science, in their eyes, as a form of "exploration". They need to see more of this.

A corollary to that main lesson above is that the mission, per se, is of greater importance to these kids than the science itself, in cultivating the kind of attitudes about scientific exploration that our nation needs.

**D. Describe the implications for future education and/or astronomy projects.**

See above, and below. I would add that future airborne astronomy educational outreach projects should not be too heavily judged on the number of bodies that they manage to fly. The richness of the experience is very strongly correlated with the degree to which the teachers are involved in all parts of the mission. The opportunities for educational outreach in airborne astronomy bear much more exploration. The most ambitious, inventive, and creative opportunities will be uncovered using programs that have fewer people.

In order to get teachers truly connected with science missions, and the researchers that head them, educational outreach programs that host teachers will have to avoid the wildlife-park model, in which large numbers of teachers are given the opportunity to "see" science being done.

**6. Are there plans to continue the project after the IDEA funding cycle ends? If so, describe how the project will be funded.**

The KAO has been retired, and airborne astronomy educational outreach will be vastly expanded and formalized in SOFIA. The possibility for an Science in the Stratosphere experience on SOFIA will depend a lot on

the opportunities that are made available by that program.

- 7. If appropriate, briefly describe the dissemination of project findings, including name and date of publication or conference.**

N/A

- 8. If appropriate, provide the URL for the project WEB page.**

<http://marple.as.utexas.edu/~WebSci>

This web page was begun with the Science in the Stratosphere program, and is being continued for math and science outreach efforts by one of our teacher participants.

- 9. Suggestions and additional comments:**

Name of Principal Investigator: Dan Lester

A handwritten signature in cursive script, appearing to read "Dan Lester", is written over a horizontal dashed line.

Date: 8/29/97